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ABSTRACT

This paper presents a Web-based environment (Web-course) designed for large groups distance learning programs in which students may benefit from the availability of large user and information bases, without losing the advantages of working in small groups. The system implements concepts of Social Translucence developed by Erickson and Kellog. Controlled visibility, mobility and management of student-produced information were built into the course organization and communication tools giving the student more alternatives and control over the process. Although the tools used in Web-course are all available elsewhere, their combination in one single environment could give the learner more flexibility and the instructor higher effectiveness in assisting the student and managing the course. The results show that collaboration and participation are positively related with visibility, mobility and performance, indicating that the addition of translucence and mobility resources to learning environment can improve the effectiveness of the process. Participant surveys also indicate satisfaction with the tools and results. Seven tables include: measures for model variables; participant-course ratings; participants not sending a single message using each tool (% of total number of participants); number of messages sent using each tool; mobility among groups; self-evaluation of participants concluding the course; and evaluation of course content by participants concluding the course. (Contains 5 references.) (Author)

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THE USE OF SOCIAL TRANSLUCENCE IN A DISTANCE EDUCATION SUPPORT ENVIRONMENT

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ABSTRACT

This paper presents a Web-based environment (Web-course) designed for large groups distance learning programs in which students may benefit from the availability of large user and information bases, without losing the advantages of working in small groups. The system implements concepts of Social Translucence developed by Erickson and Kellog [2]. Controlled visibility, mobility and management of student-produced information were built into the course organization and communication tools giving the student more alternatives and control over the process. Although the tools used in Web-course are all available elsewhere, their combination in one single environment could give the learner more flexibility and the instructor higher effectiveness in assisting the student and managing the course.

The results show that collaboration and participation are positively related with visibility, mobility and performance, indicating that the addition of translucence and mobility resources to learning environment can improve the effectiveness of the process. Participant surveys also indicate satisfaction with the tools and results.

INTRODUCTION

Collaborative work can increase the effectiveness of distance learning. In most environments students have access to a common repository of information, to the instructor and support center, and interact more intensely with a small group of other students (their cohort) as part of the learning process. Traditionally growth of the student population is handled by forming more groups, students are assigned permanently to a group at the beginning of the course and information produced in one group usually is not shared with others. As a result, information and skills that may be useful for learning and student motivation are therefore underutilized.

This paper presents a Web-based environment (Web-course) designed for large groups distance learning programs in which students may benefit from the availability of large user and information bases, without losing the advantages of working in small groups. The

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system implements concepts of Social Translucence developed by Erickson and Kellog [2] Controlled visibility, mobility and management of student-produced information were built into the course organization and communication tools that give the student more alternatives and control over the process. Although the tools used in Web-course are all available elsewhere, their combination in one single environment could give the learner more flexibility and the instructor higher effectiveness in assisting the student and managing the course.

CONCEPTUAL BACKGROUND

Groupwork and collaboration, important resources for Distance Education that have been explored by authors like Harasin [3], Murray [4] and others, are also part of the tools implemented in Web-course.

Another important concept for Web-course is "socially translucent systems . The concept "translucent is usually applied to human relations, and represents the amount of information about himself a person shares with others in a social environment. According to Erickson and Kellog [2], social systems can be classified depending on the level of members visibility, ranging from total opacity (no information available on participants) to total transparency (participants are totally visible). Translucence could then be used as a mechanism regulating the interpersonal relationships in a social environment. The present paper explores the concept in relation to group work and collaboration in a Distance Education environment. Translucence was implemented in the form of controlled participant visibility, access to and organization of persistent conversation, aided by mobility among groups and information grouping.

DEFINITIONS

Visibility: The amount of information about himself a person is willing to share with others. Visibility ranges from total opacity (I'm not willing to disclose anything about myself) to total visibility (I want to expose myself completely to others). In a social environment, members are continually controlling their visibility according to contingencies. In a remote environment members are less likely to know each other which may condition their willingness to expose themselves.

Persistent conversation: Messages exchanged among participants are recorded and organized to be accessed later. The recording may impact the participants communication behavior (Erickson and Herring [1].

Mobility: In the Web-course environment mobility represents the freedom participants have in choosing with whom to cooperate (switching groups or initiating new ones). For this choice the participants need to have information about the other participants and existing groups.

Selective Information sharing: Groups can decide on the amount of information they make available to others.

The experiment with Web-course used synchronous (chat) and asynchronous communication tools (forum, bulletin board, e-mail with discussion list and a common area for up- and downloading files). These tools allow various degrees of information structuring, ranging from chat to forum. The amount of structure depends on participants choice of communication protocol and the tools provided for communication.

The environment was developed using the concepts of Visibility and Persistent Communication from Socially Translucent Systems, Computer Mediated Communication tools (chat, e-mail, discussion lists, forum, bulletin board), allowing the presentation of instructional content, instructor support and performance evaluation. The environment allows participation, collaboration , controlled visibility and mobility. Dependent variables are participants satisfaction and learning performance.

THE WEB-COURSE ENVIRONMENT

Web-course is a Web-based learning environment for group or individual learning,, using software built on Windows NT and implemented using Microsoft ASP, Java and SQL Server.

Most communication and presentation tools were custom-developed for Web-course. The only exception was the e-mail based discussion list, which uses a Linux-based version of Majordomo. All user interfaces are based on standard Web browser. The experiment showed also that participants sometimes bypassed the system to

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use commercially available chat systems, thus avoiding the persistent communication features of Web-course. Participants can control for translucence using individual visibility control, persistent conversation and group mobility.

Each participant can control his/her own visibility to the group. Only name, login code and e-mail address are always visible to all others. This choice of visibility is made in two situations: 1. The participant can supply a text to Web-course with the information about himself he wants to share with all others. 2. Through the choice of tools and content of the messages in the communication process.

An important resource is the bulletin board, which is used for small and focused messages, like scheduling meetings, supplying hints on how-to find information or asking for help. Messages on the bulletin board are sorted by posting date, displaying author, group and text. Messages can be made visible to a single group or all participants.

The forum is also persistent, allowing in addition the structuring of information through a topic hierarchy. Participants may create any number of topics, with up to 11 sub-topics and up to 999 messages in each node. Both bulletin board and forum can be used by participant to search for groups that best suit their specific needs.

The chat is synchronous and all messages are permanently stored and can be retrieved later. Therefore the chat can also be used as an asynchronous communication tool.

Persistent conversations allow participants to know the history of a given process and use messages generated synchronously in an asynchronous mode.

IMPLEMENTING WORKGROUPS AND MOBILITY

Web-course has also resources for groupwork: participants are allowed to create new groups anytime, and can switch groups as often as they wish. A group is identified by its name, creator id and a description of its purpose. In our experiment the group creator had no control over its future content or participants decision to enter or leave the group. The experiment used two types of groups: those created by the participants themselves and those created by the instructor (all participants were originally assigned to one of them). The other was a temporary group (INFO_WEBCOURSE) designed specially for synchronous meetings with the instructor (chat). Participants would enter this group for the meeting only and return immediately to their groups. In some instances a group became then simply a (temporary) work environment with its tools (forum, chat and bulletin board) storing also the groups history and its context.

In our experiment participants were not allowed to participate simultaneously in more than one group. This limitation (to be removed in future versions of the system) required the participants to switch groups in order to access other groups information.

THE EXPERIMENT AND DATA COLECTION

The basic hypothesis is that an environment with higher (selective) visibility and mobility among groups allows participants to increase collaboration, participation, learning performance and satisfaction.

The experiment was used to test the following relationships among variables:

1. Increased Visibility is related to increased collaboration
2. Increased Visibility is related to increased mobility
3. Increased Mobility is related to increased collaboration
4. Increased Participation is related to increased collaboration
5. Increased Mobility is related to increased Participation
6. Increased Visibility is related to increased Participation
7. Increased Learning Performance is related to increased the variables above

The experiment consisted of a short (20 to 40 hours) skills-building course on "Conducting Effective Meetings ,composed of five modules, the first of which was a group dynamics for team building purposes and exploration of the computing environment. The others consisted of specific tasks, requiring the reading of texts (available for download), guided tours, searching Web sites provided by the instructor and a list of questions to be answered individually by the participants (these answers were graded by the instructor) . Since some of the questions were rather polemic, participants would benefit from discussing them with their peers. Each

participant was required to turn in his own answers, but interaction and collaboration was encouraged.

The course can be characterized as semi-asynchronous with support, because of its eventual use of synchronous tools. The instructor offered assistance both by asynchronous answers to questions and previously scheduled synchronous chat sessions.

Course participation was offered to teachers that had been assigned by the Ministry of Education to a Government-sponsored School Informatization Program [5]. These teachers were in charge of regional Educational IT support centers. They knew some of their colleagues from their State, and might have met others at the yearly National Educational Technology Conferences. 143 teachers (out of a total population of 600), from all over the Country volunteered for the course. 75 of them concluding successfully the course and 73 of them answered the questionnaires.

The Internet was used for participants registration and all other course communications.

The total duration of the course was 23 days, with strict deadlines for each of the five modules.

In order to avoid problems with anonymous participation, participants had to register formally and those who concluded successfully the course received certificates issued by the sponsoring University. These certificates could be used in future promotion processes. The data were collected in three stages: First stage: At registration time, the participants supplied demographic information and answered questions related to their expectations for an on-line Internet-based course. Second stage: The system recorded all accesses and participants communications. Third stage: At the end of the experiment, participants answered questions related to their participation and results of the course. In addition, participants who had initiated groups were interviewed for their views of this process.

Table 1 contains the measures made during the experiment and the five dimensions in which these measures were grouped.

The dimension "participation measures the students involvement with activities related to the completion of his own tasks. The dimension "collaboration measures the use of the systems tools for interaction or collaboration with other participants. Mobility measures the frequency of group switches. Visibility measures the amount of personal information shared by the participant and his attitude toward sharing (measured by questionnaire). User satisfaction, attitudes toward collaboration, etc were measured in the questionnaires. These variables were combined forming the aggregate variables: participation, collaboration, mobility, visibility and performance. The other qualitative information was obtained through the pre- and after course questionnaires.

TABLE 1
MEASURES FOR MODEL VARIABLES

Dimension	Measure
Participation	Number of Accesses to Web-course
Participation	Number of Accesses to the Bulletin Board
Participation	Number of Accesses to the Forum
Participation	Number of accesses to chat sessions
Participation	Number of requests for support
Participation	Number of concluded tasks
Collaboration	Number of e-mail sent to discussion lists
Collaboration	Number of files contributed to forum
Collaboration	Number of sent chat messages
Collaboration	Number of questions or answers sent to bulletin board
Mobility	Number of group switches
Visibility	Personal information supplied to Web-course
Performance	Average participants grades

RESULTS

The objective of the experiment was to identify the level of satisfaction of participants with the environment, the relationship among the dimensions: participation, collaboration, mobility and visibility and the influence of these factors on participants learning performance.

Overall participants satisfaction with the course: on a scale from 0 (worst) to 10 (best), participants rated the course (Table 2).

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TABLE 2
PARTICIPANT COURSE RATINGS

Rating	Frequency (%)	Cumulative Frequency (%)
0 to 6	0	0
7	6.8	6.8
8	27.4	34.2
9	31.5	65.8
10	34.2	100

This indicates a high satisfaction with the experiment. It should be noted that the participants considered the course subject important to their jobs and valued highly the course content and structure and specially the instructor support.

PARTICIPANTS DATA

70.3% have a computer and Internet access at home.
Only 21% had previous experience with distance education
Only 8% had less than 2 years of experience with computers
14% had less than 1 year of experience with the Internet
80% accessed the Internet every day
66% were connected to the Internet between 20 and 60 hours per month
70% worked between 20 and 40 hours to complete the course
80% would access the Web-course site more than 5 days a week
55% declared having used other tools, besides Web-course (ICQ, MIRC) for their coursework
47.6% of the participants abandoned the course for various reasons.
13 Participants created a total of 14 new groups, of which only two attracted a significant number of members. 8 of these group creators concluded the course.

COMMUNICATION PATTERNS

TABLE 3
PARTICIPANTS NOT SENDING A SINGLE MESSAGE USING EACH TOOL (% OF TOTAL NUMBER OF PARTICIPANTS)

Tool	Participants concluding course	Participants abandoning course
Chat	38.7	72.1
Bulletin Board	54.7	80.9
Forum	60	82.4
Support service (e-mail)	65	100
Discussion list	77.3	100

TABLE 4
NUMBER OF MESSAGES SENT USING EACH TOOL

Tool	Average per participant	Standard deviation
Chat	26.7	64.4
Bulletin Board	2.1	3.8
Forum	1.4	2.2
Support	0.7	1.4
Discussion List	0.6	1.7

Visibility: 58.7% of concluding participants did not disclose additional personal information (77.9% for non-concluding). 80% of concluding participants did not read other participants personal information and favor for collaboration those who had disclosed personal information.

PARTICIPANTS MOBILITY

Table 5 shows participants mobility among groups. At the beginning of the course all participants were assigned to group G01. G02 was a special group, created and used by the instructor for his scheduled chats with participants. Participants had to switch to G02 in order to participate in each chat session.

TABLE 5
MOBILITY AMONG GROUPS. (ROW = FROM, COLUMN = TO)

From/	G0	G0	G0	G0	G0	G0	G0	G0	G0	G1	G1	G1	G1	G1	TOT
To	1	2	3	4	5	6	7	8	9	0	1	2	3	4	
G01		50	1	28	10	3	3	2	3			4	2		106
G02	22		4	29	6	4	2	2	4	2		3	5		83
G03	1	5		1											7
G04	13	31		2		2	1	1	1	1	1				53
G05	7	6						1				1			15
G06	2	2			2		1	1					1		9
G07	2	1		4					1						8
G08	2	2			2								1		7
G09	3	5	1	2											11
G10	2	2				1								1	6
G11									1						1
G12	2	2		2	2										8
G13		6					1			1		1			9
G14		1								1					2
TOT	56	113	6	68	22	10	8	7	10	5	1	9	9	1	

DEFINITION OF VARIABLES AND TESTING THE HYPOTHESES

The concepts were measured by indices, constructed from the basic measures. These indices (one for each concept), were built as weighted sums of the variables for each dimension (Table 1). The weights were defined by the authors as a measure of their relative importance. The average for each index was defined as the weighted sum of the original variables. This average was used to create a dicotomic value (high or low) for each observation, to be used to test the hypotheses. Each combination would then result in a 2 X 2 matrix, to be tested using Qui-square (with correction for continuity for N>40), with the use of the SPSS v 8.0 package.

For each participant there would be calculated a value (V) for the following indices.

Ipart: degree of participation
Icollab: degree of collaboration
Imobi: degree of mobility
Ivisi: degree of visibility

For each index there was also obtained the weighted average (C), the cutting point, used to define the high/low values for each observation. In detail, the index and cutting point for Participation were calculated as:

$$C_{part} = 14,43*0,10 + 14,17*0,20 + 3,76*0,20 + 4,34*0,20 + 0,36*0,20 + 2,85*0,10$$

$$V_{part} = LPLOGON*0,10 + LPBULLET*0,20 + LPFORUM*0,20 + LPCHAT*0,20 + LPSUPPORT*0,20 + LPACTIVIT*0,10$$

$$I_{part} = \text{low, if } V_{part} < C_{part}$$
$$I_{part} = \text{high, if } V_{partb} >= C_{part} \quad (1)$$

Where LPLOGON is the Number of Accesses to Web-course, LPBULLET is the Number of Accesses to the Bulletin Board, LPFORUM is the Number of Accesses to the Forum, LPCHAT is the Number of accesses to chat sessions, LPSUPPORT is the Number of requests for support and LPACTIVIT is the Number of concluded tasks. The values used to define C are the averages of the variables observed in the sample.

I_{collab} was defined in a similar way, with the variables presented in Table 1.

$$C_{collab} = 0,30 * 0,10 + 16,63 * 0,30 + 0,99 * 0,30 + 1,63 * 0,30$$

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$$V_{collab} = LCEMAIL * 0,10 + LCCHAT * 0,30 + LCFORUM * 0,30 + LCBULLET * 0,30$$

$$I_{collab} = \text{low, if } V_{collab} < B_{collab}$$

$$I_{collab} = \text{high, if } V_{collab} >= B_{collab} \quad (2)$$

Were LCEMAIL is the Number of e-mail sent to discussion lists, LCCHAT is the Number of sent chat messages, LCFORUM is the Number of files contributed to forum, LCBULLET is the Number of questions or answers sent to bulletin board. The values used to define C are the averages of the variables observed in the sample.

According to Table 1, Mobility is defined by one single variable: the number of group switches (LMGROUP), with an average value of 2. Therefore,

$$I_{mobi} = \text{low, if LMGROUP} < 2$$

$$I_{mobi} = \text{high, if LMGROUP} >= 2 \quad (3)$$

The visibility index (I_{visi}) was defined as follows: "high for each participant providing a text about him/herself and "low otherwise.

The following relationships were found to be statistically significant (at the 1% significance level) in the sample.

Visibility and collaboration
Mobility and collaboration
Participation and collaboration
Mobility and participation
Visibility and participation

The relationship between mobility and visibility was not found to be statistically significant (at the 1% level). These results allow the inference that participants that expose themselves little, participate little, tend to be less collaborative and more static (low mobility among groups). Performance is also significantly correlated with participation and collaboration.

QUALITATIVE RESULTS

From the questionnaires and user interviews the authors could also conclude the following.

1. The participants valued highly the support provided by the instructor and his team, particularly the fast return. During the 23 days of the course, the team provided about 100 hours of support, mainly by e-mail. This helped motivating the participant to remain active.

2. Technology is still a problem: Participants indicated they had problems with their Internet connection, low bandwidth, system and application configuration, etc. which could be particularly annoying during synchronous chat sessions with peers or the instructor.

3. Participants demonstrated that they prefer to work synchronously (using chat). Preferred times were after lunch (1 to 2pm) or early evening (8pm). Chat session with the instructor (held every 2 or 3 days) attracted between 2 and 15 participants and were highly valued.

4. The participants preference for synchronous chat and little use of mobility may indicate that they value more traditional (hierarchical) teaching/learning methods.

5. Some participants had difficulty in structuring their communication and selecting the most appropriate tool (using instead the tools they knew best, like the bulletin board for chat-like communication, etc)

6. Structuring the group activities was also a problem for most groups(defining protocols for the use of each tool, defining forum topics, scheduling chats, etc) This indicates that there is a learning curve for this type of tools, even for experienced computer users. In fact, participants use the tools they are more familiar with, instead of the most appropriate ones: e-mail was preferred over forum, even for longer "threaded discussions, at the loss of structure and clarity.

7. Participants tended to cluster in rather stable groups characterized by regional origin, in detriment of subject oriented groups.

Tables 6 and 7 were obtained from the user questionnaires. The (high) motivation of participants during the course may be related to their perception of course quality and perceived performance. Based on self-evaluation, 74% of the participants concluding the course rated their own performance with grades above 8

(on a 0 to 10 scale) and only 26% rated it between 6 and 7. The course content also received high marks, with 82% considering it excellent (grades 9 and 10) and 18% rating it good (grades 7 and 8).

TABLE 6
SELF-EVALUATION OF PARTICIPANTS CONCLUDING THE COURSE

Grade	Frequency	%	% accum.
6	7	9,6	9,6
7	12	16,4	26,0
8	42	57,5	83,6
9	8	11,0	94,5
10	4	5,5	100,0
Total	73	100,0	

The results indicated also that participants have to learn to work in this richer environment (creating and switching groups, searching for course-wide group generated information, publishing group information, etc.). Successful participant-created groups were usually based on existing social ties (regional groups) or had a very narrow task focus. Many groups did not succeed in attracting participation. Searching participant-produced information and switching groups was heavily used only by a small group of participants.

TABLE 7
EVALUATION OF COURSE CONTENT BY PARTICIPANTS CONCLUDING THE COURSE

Grade	Frequency	%	% accum
7	3	4,1	4,1
8	10	13,7	17,8
9	21	28,8	46,6
10	39	53,4	100,0
Total	73	100,0	

CONCLUSIONS

The results show that collaboration and participation are positively related with visibility, mobility and performance, indicating that the addition of translucence and mobility resources to learning environment can improve the effectiveness of the process. The results indicate that users are satisfied with the Web-course environment, allowing them more flexibility in workgroup collaboration and access to user-generated information. The multiple tools give the instructor a better view of students performance and allows more effective intervention in the learning process. The usefulness of the different tools will depend on the characteristics of the course activities, on the students skills in using them and on students learning behavior, since they must learn to take advantage of the new possibilities of collaborative work, breaking away from imposed static structures. Course designers will also have new possibilities for designing students activities. Students prefer workgroups that have social cohesion or a strong task focus. Future developments of Web-course will allow more participants control over the group forming and switching process and better tools for (selective) sharing of information produced by the groups and also access to statistical data on group behavior.

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